

A QUANTITATIVE STUDY OF THE VEGETATION SURROUNDING
POPULATIONS OF *UVULARIA SESSILIFOLIA* (COLCHICACEAE) AT FORT POLK
IN WEST CENTRAL LOUISIANA, U.S.A.

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ABSTRACT

Sessile leaf bellwort (*Uvularia sessilifolia*) is a rare species (S2) in Louisiana with reports from Caddo, Claiborne, Grant, Lincoln, Morehouse, Ouachita, Union, and Vernon parishes. Quantitative data from 4 populations (56 samples) in Vernon Parish are reported, and the plant community associated with *U. sessilifolia* is described. In west central Louisiana, *U. sessilifolia* is found along baygall streams and is associated with the tree species: *Ilex vomitoria*, *Hamamelis virginiana*, and *Liquidambar styraciflua*; the shrub species *Vaccinium elliotii*, *Acer rubrum* var. *drummondii*, and *Pinus taeda*; the woody vine species *Smilax smallii*, *Vitis rotundifolia*, and *Smilax glauca*; and the herbaceous species *Woodwardia areolata*, *Chasmanthium laxum*, and *Mitchella repens*.

RESUMEN

Uvularia sessilifolia es una especie rara (S2) en Luisiana con citas de la parroquias de Caddo, Claiborne, Grant, Lincoln, Morehouse, Ouachita, Union, y Vernon. Se citan datos cuantitativos de 4 poblaciones (56 muestras) en la parroquia de Vernon, y se describe la comunidad vegetal asociada con *U. sessilifolia*. En el cenro oeste de Louisiana, *U. sessilifolia* se encuentra a lo largo de torrentes y está asociada con las especies: *Ilex vomitoria*, *Hamamelis virginiana*, y *Liquidambar styraciflua*; las especies arbustivas *Vaccinium elliotii*, *Acer rubrum* var. *drummondii*, y *Pinus taeda*; las especies trepadoras *Smilax smallii*, *Vitis rotundifolia*, *Smilax glauca*; y las especies herbáceas *Woodwardia areolata*, *Chasmanthium laxum*, y *Mitchella repens*.

INTRODUCTION

Sessile leaf bellwort (*Uvularia sessilifolia* L.) is a native rhizomatous herbaceous perennial in the Colchicaceae. It is reported from the following states in the US: AL, AR, CT, DC, DE, FL, GA, IA, IL, IN, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, ND, NH, NJ, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and from the following provinces in Canada: MB, NB, NS, ON, and QC (USDA NRCS 2013). NatureServe (2013) has a similar distribution but also reports this species for Kansas but not for Texas, and in the *Flora of North America* treatment for this species, it is not reported for South Dakota (Utech & Kawano 2003). Sessile leaf bellwort is listed globally as G5 and S1 in KS, ND, and OK; S2 in LA; S3? in IL; S3 in IA; S4 in DE, NC, and WV; and S5 in KY, NJ, NY, and VA (NatureServe 2013). In Canada, it is listed as S2 in MB, S4 in ON, S4S5 in NS, and S5 in NB and QC. In Louisiana, this S2 species is reported from Caddo, Claiborne, Grant, Lincoln, Morehouse, Ouachita, Union, and Vernon parishes (Louisiana Natural Heritage Program 2011; Thomas & Allen 1993). In east Texas, it is reported from Cass, Jasper, and Newton counties (USDA NRC 2013; Diggs et al. 2006). In Mississippi and especially in Arkansas, this species is widespread with reports from several counties (USDA NRCS 2013).

This species is reported from forested seeps and bayhead swamps in Louisiana (Louisiana Natural Heritage Program 2011) and from deep ravines and mesic forests in east Texas (Diggs et al. 2006). The habitats reported for this species in the *Flora of North America* are moist hardwood coves, alluvial bottomlands, thickets, and xeric woods northwards (Utech & Kawano 2003). In the Carolinas, it is reported from alluvial woods and coves (Radford et al. 1968).

The objectives of this study were to document and quantitatively characterize the dominance of the vascular plant species associated with sessile leaf bellwort and to describe its habitat in west central Louisiana. Twenty-eight different clumps of sessile leaf bellwort are reported from Fort Polk in Vernon Parish. Some of

these are small with only a few or only one stem(s). The four largest populations were selected for this study. Three of the populations were on Guyton-Iuka complex and one was partially on Briley loamy fine sand and partially on the Guyton-Iuka complex (Soil Survey Division 2003).

METHODS

The four largest *Uvularia sessilifolia* populations included two along Bird's Creek and one each along Ouiska Chitto Creek and East Fork Sixmile Creek. At each population, a macroplot that encompassed the entire *U. sessilifolia* was created with the width of all macroplots being 8 m and the length variable depending on the population size. Each macroplot was subdivided into the maximum number of samples (0.5 m × 8 m). A random number generator was used to select which of the samples would be used. At each location, 50 % (½) of the samples were selected for sampling and resulted in a total of 56 samples in the four macroplots.

The plant categories sampled included herbaceous plants, woody vines, shrubs and saplings (woody non-vine species shorter than 6 ft = 1.83 m), and trees and shrubs (woody non-vine species taller than 6 ft = 1.83 m). During the sampling period, the number of stems in a sample for each species were counted and recorded. For herbaceous plants, woody vines, and shrubs and saplings, cover was determined by measuring the area occupied by the plant(s) in the sample. The cover percent was calculated by multiplying the area times the density and then dividing by the area of the sample (40,000 cm²). The cover was converted to a percent by multiplying by 100. For the trees and shrubs taller than 1.83 m, the dbh (diameter breast high) was measured at the standard 1.37 m height using a diameter tape and recorded to the nearest 0.1 cm.

All data were entered into a Microsoft Excel spreadsheet for storage and calculation of variables. The mean diversity (richness-species per sample) and mean density (stems per sample) were calculated for all plants and for each of the four plant categories. Mean cover percent was calculated for herbaceous plants, woody vines, and shrubs/saplings, and mean dbh (cm per sample) was calculated for trees/shrubs.

The frequency was calculated for each species in a sample group by dividing the number of samples of occurrence by the total number of samples (56). It was converted to a percent by dividing by 100. The mean density was calculated for each species in a sample group by totaling the densities from all samples and dividing by 56. Mean cover percent for each herbaceous, woody vine, and shrub/sapling species was calculated by totaling the cover percent from all 56 samples and dividing by 56. The mean dbh was calculated for the tree/shrub species by totaling the dbh from all samples and dividing by 56.

The relative values for each of these variables (frequency, mean density, mean dbh, and mean cover percent) were calculated by dividing the value for a species by the total for all species within the plant category. Each relative value was converted to a percent by multiplying by 100. The relative frequency, relative density, and relative cover percent were totaled to produce the importance value for each herbaceous, woody vine, and shrub/sapling species. The relative frequency, relative density, and relative dbh were totaled to produce the importance value for each tree/shrub species.

RESULTS

A total of 90 (31 herbaceous, 14 woody vines, and 45 trees/shrubs/saplings) species were observed in all 56 samples with a mean number of species per sample of 21.79 (Table 1). The mean diversity per sample ranged from 1.46 species per sample for trees/shrubs to 9.88 species for shrubs/saplings. The mean number of stems per sample (density) for all plants was 151.32 stems and ranged from 1.91 stems per sample for trees/shrubs to 85.23 for herbaceous plants. The mean cover percent for all plants was 68.43 percent and ranged from 4.76 percent for woody vines to 43.40 percent for herbaceous plants. The dbh averaged 9.17 cm per sample.

The frequency, mean density, relative mean cover percent, and importance value for each herbaceous species (listed in descending importance value) are in Table 2. Since the macroplots for sampling were centered on *Uvularia sessilifolia*, it is not surprising that it has the highest importance value. The three species with the next highest importance value are *Woodwardia areolata*, *Chasmanthium laxum*, and *Mitchella repens*. The frequency, mean density, mean cover percent, and importance value for each woody vine species (listed in descending importance value) are in Table 3. The three species with the highest importance value are *Smilax smallii*, *Vitis*

TABLE 1. Community variables for 56 sample plots around four *Uvularia sessilifolia* macroplots on Fort Polk in West Central Louisiana.

	DIVERSITY				
	All Plants	Herbaceous Plants	Shrubs/Saplings	Trees/Shrubs	Woody Vines
Mean	21.79	6.63	9.88	1.46	4.73
Std Dev.	4.75	2.11	2.43	1.44	1.84
Range	11–29	1–10	4–15	0–6	0–9
Total Number	90	31	45	24	14
	DENSITY				
	All Plants	Herbaceous Plants	Shrubs/Saplings	Trees/Shrubs	Woody Vines
Mean	151.32	85.23	1.91	45.18	19.00
Std Dev.	79.48	58.38	2.12	21.59	17.17
Range	33–361	9–265	0–9	10–107	0–108
	COVER PERCENT			DBH CM	
	All Plants	Herbaceous Plants	Shrubs/Saplings	Trees/Shrubs	Woody Vines
Mean	68.43	42.40	21.27	4.76	9.17
Std Dev.	30.77	29.58	15.96	5.28	11.23
Minimum	14.88–154.31	1.37–131.7	2.20–73.32	0–24.05	0–44.4

TABLE 2. Frequency, mean density, mean cover percent, and importance value for herbaceous species in 56 sample plots around four *Uvularia sessilifolia* macroplots on Fort Polk in West Central Louisiana.

Species	frequency	mean density	mean cover %	importance value
<i>Uvularia sessilifolia</i>	82.14	31.86	5.39	62.49
<i>Woodwardia areolata</i>	44.64	11.30	12.76	50.10
<i>Chasmanthium laxum</i>	82.14	12.04	9.23	48.29
<i>Mitchella repens</i>	80.36	14.77	1.63	33.30
<i>Osmunda cinnamomea</i>	37.50	1.13	8.02	25.89
<i>Dichantherium commutatum</i>	60.71	2.86	0.58	13.88
<i>Scleria</i> spp.	46.43	3.05	1.25	13.55
<i>Carex debilis</i>	32.14	2.48	0.98	10.08
<i>Osmunda regalis</i>	21.43	0.46	1.22	6.65
<i>Solidago caesia</i>	23.21	1.63	0.36	6.25
<i>Viola</i> × <i>primulifolia</i>	25.00	0.89	0.08	5.01
<i>Dichantherium dichotomum</i>	19.64	0.59	0.13	3.95
<i>Chasmanthium latifolium</i>	16.07	0.54	0.32	3.80
<i>Aster lateriflorus</i>	14.29	0.23	0.08	2.63
<i>Dichantherium boscii</i>	12.50	0.27	0.07	2.37
<i>Athyrium filix-femina</i>	8.93	0.21	0.14	1.92
<i>Tipularia discolor</i>	10.71	0.21	0.01	1.89
<i>Arisaema triphyllum</i>	10.71	0.14	0.00	1.79
<i>Elephantopus tomentosus</i>	5.36	0.07	0.02	0.94
<i>Solidago arguta</i>	5.36	0.09	0.01	0.93
<i>Pteridium aquilinum</i>	3.57	0.13	0.07	0.85
<i>Dioscorea villosa</i>	3.57	0.09	0.02	0.70
<i>Dichantherium</i> spp.	3.57	0.05	0.00	0.61
<i>Carex intumescens</i>	1.79	0.02	0.02	0.33
<i>Lilium michauxii</i>	1.79	0.02	0.01	0.31
<i>Diodia teres</i>	1.79	0.04	0.00	0.31
<i>Dichantherium laxiflorum</i>	1.79	0.02	0.00	0.30
<i>Pleopeltis polypodioides</i>	1.79	0.02	0.00	0.29
<i>Bidens aristosa</i>	1.79	0.02	0.00	0.29
<i>Botrychium bitermum</i>	1.79	0.02	0.00	0.29
Total	662.50	85.23	42.40	300.00

TABLE 3. Frequency, mean density, mean cover percent, and importance value for woody vine species in 56 sample plots around four *Uvularia sessilifolia* macroplots on Fort Polk in West Central Louisiana.

Species	frequency	mean density	mean cover %	importance value
<i>Smilax smallii</i>	55.36	3.43	0.87	47.94
<i>Vitis rotundifolia</i>	51.79	1.36	1.34	46.20
<i>Smilax glauca</i>	80.36	2.88	0.50	42.56
<i>Smilax laurifolia</i>	32.14	4.52	0.04	31.41
<i>Gelsemium sempervirens</i>	44.64	0.96	0.73	29.82
<i>Smilax pumila</i>	44.64	1.95	0.41	28.21
<i>Parthenocissus quinquefolia</i>	37.50	1.02	0.36	20.82
<i>Smilax rotundifolia</i>	33.93	0.64	0.15	13.65
<i>Toxicodendron radicans</i>	30.36	0.63	0.16	13.12
<i>Bignonia capreolata</i>	26.79	0.95	0.10	12.77
<i>Rubus argutus</i>	17.86	0.29	0.05	6.39
<i>Smilax</i> spp.	7.14	0.29	0.03	3.63
<i>Berchemia scandens</i>	8.93	0.09	0.01	2.59
<i>Smilax bona-nox</i>	1.79	0.02	0.02	0.89
Total	473.21	19.00	4.76	300.00

rotundifolia, and *Smilax glauca*. The frequency, mean density, mean cover percent, and importance value for each shrub/sapling species (listed in descending importance value) are in Table 4. The three shrub/sapling species with the highest importance value are *Vaccinium elliotii*, *Acer rubrum* var. *drummondii*, and *Pinus taeda*. The frequency, mean density, mean dbh, and importance value for each tree/shrub species (listed in descending importance value) are in Table 5. The three tree/shrub species with the highest importance value are *Ilex vomitoria*, *Hamamelis virginiana*, and *Liquidambar styraciflua*.

DISCUSSION

The habitat for *Uvularia sessilifolia* in west central Louisiana is along the edge of baygalls as indicated by the association with *Woodwardia aerolata*, *Chasmanthium laxum*, and *Acer rubrum* var. *drummondii* but in the slightly higher and dryer sites within the baygall as indicated by the association with *Mitchella repens*, *Smilax smallii*, *Ilex vomitoria*, and *Hamamelis virginiana*. Allen et al. (2013) reports *Chasmanthium laxum* and *Mitchella repens* as two of the top three herbaceous species in baygalls associated with *Xanthorhiza simplicissima* Marsh. These authors also list *Vitis rotundifolia* and *Smilax glauca* as two of the top three woody vines in their study. *Vaccinium elliotii*, *Liquidambar styraciflua*, and *Acer rubrum* var. *drummondii* were in the top five species of trees/shrubs/saplings in their study.

We found the tree canopy/subcanopy vegetation associated with *Uvularia sessilifolia* to be *Ilex vomitoria*, *Hamamelis virginiana*, *Liquidambar styraciflua*, *Magnolia virginiana* L., *Acer rubrum* var. *drummondii*, *Quercus alba* L., *Persea palustris* (Raf.) Sarg., and *Fagus grandifolia* Ehrh. *Magnolia virginiana* and *Persea palustris* are very typical baygall plants (Allen et al. 2004; Diggs et al. 2006; MacRoberts et al. 2004), and *Ilex vomitoria*, *Hamamelis virginiana*, *Quercus alba*, and *Fagus grandifolia* are indicators of higher dryer sites. The shrub/sapling layer (Table 4) also had a mixture of typical baygall plants (*Vaccinium elliotii*, *Acer rubrum* var. *drummondii*, *Rhododendron canescens* (Michx.) Sweet, and *Persea palustris*) plus species of higher dryer sites (*Pinus taeda*, *Ilex vomitoria*, *Carpinus caroliniana* Walt., *Hamamelis virginiana*, and *Symplocos tinctoria* (L.) L'Her.).

The herbaceous associates of *Uvularia sessilifolia* in our study that are baygall species were *Woodwardia areolata*, *Chasmanthium laxum*, *Osmunda cinnamomea* L., *Carex debilis* Michx., *Osmunda regalis* L., *Viola × primulifolia* L., and *Dichanthelium dichotomum* L. And the associate species that are typical of higher dryer sites like natural levees are *Mitchella repens*, *Dichanthelium commutatum* (J.A. Schultes) Gould, *Scleria* spp., and *Solidago caesia* L. Two woody vine species, *Vitis rotundifolia* and *Smilax laurifolia* L., were associated with

TABLE 4. Frequency, mean density, mean cover percent, and importance value for shrub/sapling species in 56 sample plots around four *Uvularia sessilifolia* macroplots on Fort Polk in West Central Louisiana.

species	frequency	mean density	mean cover %	importance value
<i>Vaccinium elliotii</i>	60.71	1.84	5.68	36.91
<i>Acer rubrum</i> var. <i>drummondii</i>	87.50	8.80	1.56	35.70
<i>Pinus taeda</i>	53.57	6.91	0.20	21.68
<i>Ilex vomitoria</i>	60.71	2.18	1.39	17.51
<i>Carpinus caroliniana</i>	37.50	4.45	0.63	16.62
<i>Hamamelis virginiana</i>	48.21	2.16	1.37	16.12
<i>Symplocos tinctoria</i>	39.29	1.61	1.65	15.29
<i>Rhododendron canescens</i>	51.79	2.39	0.39	12.37
<i>Persea palustris</i>	50.00	1.07	0.79	11.16
<i>Ilex opaca</i>	57.14	1.66	0.33	11.01
<i>Quercus hemisphaerica</i>	42.86	1.13	0.61	9.69
<i>Nyssa biflora</i>	44.64	2.02	0.11	9.52
<i>Quercus alba</i>	37.50	1.20	0.43	8.48
<i>Fagus grandifolia</i>	23.21	0.45	1.08	8.43
<i>Vaccinium virgatum</i>	16.07	0.66	1.05	8.02
<i>Halesia diptera</i>	25.00	0.43	0.87	7.55
<i>Quercus laurifolia</i>	35.71	1.07	0.20	6.91
<i>Hypericum hypericoides</i>	23.21	1.41	0.17	6.25
<i>Morella caroliniensis</i>	10.71	0.50	0.47	4.41
<i>Prunus serotina</i>	26.79	0.43	0.09	4.09
<i>Lyonia lucida</i>	7.14	0.16	0.60	3.89
<i>Crataegus marshallii</i>	10.71	0.20	0.36	3.23
<i>Viburnum dentatum</i>	17.86	0.46	0.03	2.97
<i>Magnolia virginiana</i>	12.50	0.23	0.20	2.71
<i>Ilex coriacea</i>	16.07	0.29	0.04	2.46
<i>Callicarpa americana</i>	14.29	0.21	0.06	2.20
<i>Cornus florida</i>	12.50	0.20	0.06	2.00
<i>Ostrya virginiana</i>	5.36	0.23	0.19	1.96
<i>Itea virginica</i>	5.36	0.07	0.13	1.33
<i>Liquidambar styraciflua</i>	7.14	0.07	0.09	1.32
<i>Magnolia grandiflora</i>	3.57	0.07	0.13	1.13
<i>Styrax americanus</i>	7.14	0.11	0.03	1.10
<i>Vaccinium fuscatum</i>	3.57	0.09	0.05	0.82
<i>Styrax grandifolius</i>	5.36	0.09	0.01	0.80
<i>Carya texana</i>	5.36	0.05	0.02	0.73
<i>Vaccinium arboreum</i>	1.79	0.02	0.10	0.69
<i>Carya alba</i>	3.57	0.04	0.01	0.48
<i>Sassafras albidum</i>	3.57	0.04	0.00	0.45
<i>Ilex longipes</i>	1.79	0.04	0.03	0.41
<i>Chionanthus virginicus</i>	1.79	0.05	0.02	0.39
<i>Ligustrum sinense</i>	1.79	0.04	0.00	0.26
<i>Viburnum acerifolium</i>	1.79	0.02	0.00	0.24
<i>Triadica sebifera</i>	1.79	0.02	0.00	0.23
<i>Euonymus americana</i>	1.79	0.02	0.00	0.23
<i>Viburnum nudum</i>	1.79	0.02	0.00	0.22
Total	987.50	45.18	21.27	300.00

sessilifolia and are typical baygall species. The other woody vine associates, *Smilax smallii*, *Smilax glauca*, *Gelsemium sempervirens* (L.) St. Hil., and *Smilax pumila* Walt., are more typically found in higher dryer sites.

Our data are the first quantitative description on the vegetation surrounding *Uvularia sessilifolia*. The vegetation around the other populations of *U. sessilifolia* throughout its range should be sampled for comparison with our data so as to get a better idea of the variation, if any, of its habitat.

TABLE 5. Frequency, mean density, mean dbh, and importance value for tree/shrub species in 56 sample plots around four *Uvularia sessilifolia* macroplots on Fort Polk in West Central Louisiana.

species	frequency	mean density	mean dbh (cm)	importance value
<i>Ilex vomitoria</i>	19.64	0.36	0.84	41.26
<i>Hamamelis virginiana</i>	17.86	0.32	0.74	37.06
<i>Liquidambar styraciflua</i>	10.71	0.13	1.54	30.67
<i>Magnolia virginiana</i>	5.36	0.13	1.35	24.90
<i>Acer rubrum</i> var. <i>drummondii</i>	10.71	0.13	0.50	19.33
<i>Quercus alba</i>	3.57	0.04	0.99	15.10
<i>Persea palustris</i>	7.14	0.09	0.51	15.08
<i>Fagus grandifolia</i>	8.93	0.09	0.27	13.75
<i>Carpinus caroliniana</i>	7.14	0.07	0.39	12.84
<i>Nyssa biflora</i>	5.36	0.05	0.58	12.73
<i>Quercus laurifolia</i>	7.14	0.09	0.24	12.22
<i>Prunus serotina</i>	7.14	0.07	0.15	10.29
<i>Ilex opaca</i>	7.14	0.07	0.13	10.04
<i>Pinus taeda</i>	3.57	0.04	0.42	8.85
<i>Magnolia grandiflora</i>	3.57	0.04	0.14	5.87
<i>Symplocos tinctoria</i>	3.57	0.04	0.07	5.03
<i>Vaccinium elliotii</i>	3.57	0.04	0.05	4.89
<i>Quercus hemisphaerica</i>	3.57	0.04	0.04	4.80
<i>Carya texana</i>	1.79	0.02	0.07	2.93
<i>Ostrya virginiana</i>	1.79	0.02	0.04	2.64
<i>Rhododendron canescens</i>	1.79	0.02	0.04	2.58
<i>Ilex coriacea</i>	1.79	0.02	0.03	2.45
<i>Cornus florida</i>	1.79	0.02	0.02	2.35
<i>Morella caroliniensis</i>	1.79	0.02	0.02	2.35
Total	146.43	1.91	9.17	300.00

ACKNOWLEDGMENTS

We thank Kristen Mayo, Brian Early, and Jeff McMillian for assistance in data collection. Appreciation is extended to the reviewers, David Rosen and Michael MacRoberts.

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